GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION
SPONSORED PROJECT INITIATION

No action AB OAL

Date: April 28, 1978

Project Title: Extension Services

Project No: A-2141

Project Director: Don Lodge

Sponsor: Korea Credit Guarantee Fund

Agreement Period: From 4/26/78 Until 4/25/79

Type Agreement: Contract dated April 26, 1978

Amount: $49,761*

Reports Required: Quarterly, Annual

Sponsor Contact Person (s):

Technical Matters	Contractual Matters (thru OCA)
Mr. Jae Chull Chung Chairman and President Korea Credit Guarantee Fund C. P. O. Box 1029 Seoul, Korea	

*Including $12,000 local expenses in Korea to be paid for by KCGF.

Defense Priority Rating:

Assigned to: International Programs Office (School/Laboratory)

COPIES TO:

- Project Director
- Division Chief (EES)
- School/Laboratory Director
- Dean/Director–EES
- Accounting Office
- Procurement Office
- Security Coordinator (OCA) ✓
- Reports Coordinator (OCA)
- Library, Technical Reports Section
- EES Information Office
- EES Reports & Procedures
- Project File (OCA)
- Project Code (GTRI)
- Other

CA–3 (3/76)

GEORGIA INSTITUTE OF TECHNOLOGY
OFFICE OF CONTRACT ADMINISTRATION

SPONSORED PROJECT TERMINATION

Date: 10/23/79

Project Title: Extension Services

Project No: A-2141

Project Director: Donald E. Lodge

Sponsor: Korea Credit Guarantee Fund

Effective Termination Date: 4/25/79

Clearance of Accounting Charges: 4/25/79

Grant/Contract Closeout Actions Remaining:

_ Final Invoice ~~and Closing Documents~~
_ Final Fiscal Report
_ Final Report of Inventions
_ Govt. Property Inventory & Related Certificate
_ Classified Material Certificate
_ Other _____

Assigned to: EEL/ID (School/Laboratory)

COPIES TO:

Project Director
Division Chief (EES)
School/Laboratory Director
Dean/Director—EES
Accounting Office
Procurement Office
Security Coordinator (OCA)
Reports Coordinator (OCA) ✓

Library, Technical Reports Section
EES Information Office
Project File (OCA)
Project Code (GTRI)
Other _____

CA—4 (1/79)

Project A-2141

Quarterly Progress Report

EXTENSION SERVICES TO THE KOREA CREDIT GUARANTEE FUND

April 26 - August 31, 1978

by

Donald E. Lodge

Office of International Programs
Engineering Experiment Station
Georgia Institute of Technology
Atlanta, Georgia 30332, U.S.A.

Quarterly Progress Report

EXTENSION SERVICES TO THE
KOREA CREDIT GUARANTEE FUND

April 26 - August 31, 1978*

Work Completed During the Quarter

Training

A four-week training program was conducted for four members of the KCGF Extension Services Department between May 22 and June 16. Three weeks of training were conducted in Atlanta, with the fourth week being devoted to visits to four Georgia Tech area extension offices and 12 industries which have received technical assistance from Georgia Tech. In addition to classroom presentations by nine Georgia Tech research and academic faculty members, the KCGF staff members met with the personnel of two Atlanta banks, and with staff members of the Atlanta Regional Office of the Small Business Administration and the Small Business Development Center of the University of Georgia. A schedule of the training program appears as Appendix 1.

Work Begun During the Quarter

Provision of Management and Technical Assistance

On July 16, Donald E. Lodge arrived in Seoul to begin providing management and technical assistance to selected clients of the KCGF. During his four-week visit, which ran into the second quarter, he accomplished the following:

1. Attended a three-day seminar for company presidents, at which he made a presentation on the Georgia Tech extension program and discussed the KCGF program individually with a number of the attending presidents.

2. Fourteen plant visits were made to seven client firms for the purpose of gathering data on these companies and their needs for assistance, or to present suggestions or recommendations. Three of the firms were each called upon three times, one firm was visited twice, and three were each visited one time. Detailed reports on these visits appear as Appendices 2-8.

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*This report includes four months rather than three in order to cover the total time spent in Korea by Donald E. Lodge.

At the end of his visit, Mr. Lodge, Mr. Ho Jin Kim, and Mr. Un Young Lee set priorities for the seven firms which had been visited by Mr. Lodge. These priorities were based on subjective estimates of the possible or potential effects of Georgia Tech's work with each firm. It was assumed that each firm will adopt whatever recommendations might be made and that these actions will be successfully carried out.

These priorities are, from highest to lowest:

1. Hyandae Bottle Manufacturing Company
2. Sam Mock Kang-Up Company, Ltd.
3. Dong Sung Machine Industry Company, Ltd.
4. Hongjin Engineering Company, Ltd.
5. Joongwon Commercial Company, Ltd.
6. Seoum Electronic Company, Ltd.
7. International Electric Company, Ltd.

Problem-Solving Technical Information

During this reporting period, Mr. Richard Johnston conducted the following searches for information relative to this project:

1. Hongjin Engineering Company

   a. Standardized drawings
      - Searched GIT Library catalog for pertinent publications.
      - Searched mechanical drawing texts for references.
      - Conducted computer search on DIALOG, Xeroxed one pertinent article, and ordered 16 other articles.
      - Wrote to drafting equipment manufacturers and suppliers seeking material.
      - Talked to Dr. Earl Wheby of GIT.
      - Wrote to the American Institute of Design and Drafting.

2. International Electric Company

   a. Dry-type transformer technology
      - Talked to Dr. Roger P. Webb of GIT regarding design capabilities on campus and mailed information to KCGF on August 9.
      - Made initial contact with General Electric regarding licensing.
      - Made initial contact with U.S. licensing association.

   b. Sources for overload relays
      - Prepared list of potential suppliers from Thomas Register.

c. Sources for automatic machines to manufacture motors

- Prepared list of firms from Thomas Register.

3. Seoum Electronic Company

a. Inventory systems

- Asked U.S. Department of Commerce for list of U.S. computer companies doing business in Korea.
- Discussed the problem with Dr. Fyffe of GIT.

4. Joongwon Commercial Company

a. Industrial design firms

- Located design firm in Atlanta, obtained data on normal contract terms and sent same to KCGF on August 9.
- Requested list of U.S. design firms from national trade association.
- Requested list of U.S. design firms serving plastics industry from that industry's trade association.

b. Inventory systems

Same items as shown above for Seoum Electronics Company.

5. Hyandae Bottle Manufacturing Company

a. Equipment suppliers

- Requested and received list of equipment manufacturers from U.S. association.
- Wrote four suppliers.

6. Dongsung Machinery Company

a. Licensor for conveyor designs

- Contacted licensing association for list of members.
- Contacted conveyor manufacturers trade association for data.

Appendix 1

KCGF TRAINING PROGRAM

Appendix 1

Project A-2141
KCGF - SCHEDULE OF TRAINING
May 22 - June 16, 1978

Date	Time	Speaker	Location	Subject or Activities
May 22		Johnston	OIP	Assign office space
	9:00 a.m.	Hammond/ All Staff	OIP	Welcome
	9:30 a.m.	OIP Staff	OIP	Coffee and doughnuts
	11:00 a.m.	Johnston	OIP	Explain program, present publications, explain security
	2:00 p.m.	Hammond	OIP	Background and activities of OIP
	3:00 p.m.	Johnston	OIP	Tours - C&S Bank Building - Tech Campus
May 23	9:00 a.m.	Hammond/ Staff	OIP	The KCGF Approach to Furnishing Industrial Extension Services to SSI
	2:00 p.m.	Lodge	OIP	Needs of SSI
May 24	9:00 a.m.	Hammond	OIP	Small Industry Organization and Characteristics
	2:00 p.m.	Potts	OIP	Case Studies of Industries
May 25	9:00 a.m.	Hammond	OIP	Industrial Extension Theory and Practice - Guidelines
	2:00 p.m.	Potts	OIP	Case Studies Industries
May 26	9:00 a.m.	Lodge	OIP	Industrial Extension Forms and Procedures
	2:00 p.m.	OIP Staff	OIP	Reception for KCGF students and Korean Community in Atlanta

Appendix 1 (continued)

Date	Time	Supervisor	Location	Subject or Activity
May 29	11:00 a.m.	Ed Lewis	Albany	Orientation regarding Albany Area Office
	1:30 p.m.	Ed Lewis		Leave for Pelham
	2:00 p.m.	Ed Lewis	Pelham	Tour Hercules Bumpers, Inc.
	2:45 p.m.	Ed Lewis		Leave for Moultrie
	3:30 p.m.	Ed Lewis	Moultrie	Tour Southern Recaps, Inc.
	4:45 p.m.	Ed Lewis		Return to Albany
May 30	7:00 a.m.	James	Enigma	Drive to Enigma and tour Bomac Manufacturing
	1:00 p.m.	Dudley	Waycross	Drive to Waycross and visit Haynes Industries
	3:00 p.m.	Dudley	Douglas	Drive to Douglas and visit Douglas Foods, Inc.
May 31	9:30 a.m.	Edens	Baxley	Tour Selco Products, Inc.
	10:30 a.m.	Edens	Baxley	Tour Baxley Industries, Inc.
	2:30 p.m.	Edens	Claxton	Tour Alpha Galvanizing, Inc.
	5:00 p.m.	Edens	Savannah	Arrive at motel in Savannah
June 1	8:30 a.m.	Edens	Savannah	Meeting at Savannah Area Office to discuss office activities
	10:00 a.m.	James	Savannah	Depart Savannah
	2:00 p.m.	Craig	Jackson	Tour Quality Products Company
	4:00 p.m.	Craig	Macon	Meet with Tom Murphy and Tom Moody, Macon Chamber of Commerce
	5:00 p.m.	Craig	Macon	Tour of industrial parks
June 2	8:30 a.m.	Craig	Macon	Tour Brown and Williamson Tobacco Company plant
	10:30 a.m.	Craig	Thomaston	Tour Lanier Electronics Laboratories
	11:30 a.m.	James		Leave for Atlanta

Appendix 1 (continued)

Date	Time	Speaker	Location	Subject or Activities
June 5	9:00 a.m.	Fyffe	OIP	Technical Study - Cost Estimates
	2:00 p.m.	Lodge	OIP	Workshop - Case Study
June 6	10:00 a.m.	McCarty	C&S	Loan Management
	2:00 p.m.	Lodge	OIP	Project Feasibility Analysis - Workshop - Case Study
June 7	9:00 a.m.	Cheung	OIP	Pro Forma Financial Statement
	1:00 p.m.	Woodall	Trust Co.	Evaluation of Management Capabilities
June 8	9:00 a.m.	Clifton	OIP	Project Feasibility Study - Market Study
	2:00 p.m.	Lodge	OIP	Workshop - Case Study Preparation
June 9	9:00 a.m.	Malvar/ Dodd	Library	Data base searching
	2:00 p.m.	Lodge/ KCGF		Case study preparation
June 12	9:00 a.m.	KCGF		Presentation of case study problems by KCGF students
	2:00 p.m.	Johnston		Information - Sources and Use of Technical Information for Industrial Projects
June 13	10:00 a.m.	SBA	SBA	Management Assistance Programs of SBA
	2:00	SBA	SBA	
June 14	10:00 a.m.	SBDC	Athens	Small Business Development Center; Loan Making - Finance
	2:00 p.m.	SBA	SBA	
June 15	10:00 a.m.	SBA	SBA	Loan Servicing - Portfolio Management
	2:00 p.m.	SBA	SBA	
June 16	9:00 a.m.		OIP	Research
	11:30 a.m.	Lodge	OIP	Graduation
	p.m.			OPEN

Appendices 2-8

KOREAN COMPANIES VISITED BY LODGE DURING JULY AND AUGUST, 1978

Appendix 2

HONGJIN ENGINEERING COMPANY LTD.

Contacts:

President, Yong-pyo Hong
41 years old
Graduate of Machinery Department
Seoul National University

Executive Director
Hyon-chol Shinn
37 years old
Graduate of Machinery Department
Seoul National University
Speaks good English

Present Employment: 120

Present Product Line

Capacity	Span
5 - 7.5 tons (metric)	10 meters
7.5 - 10.0 tons	10 - 15 meters
10.0 - 15.0 tons	15 - 20 meters
20.0 - 30.0 tons	20 - 25 meters
30.0 - 40.0 tons	
40.0 - 50.0 tons	

Last Year's Production (estimated), 1977

1.	Jib crane 0.5 - 5.0 tons (metric)	+ 15-20 units
2.	Hoist crane 0.5-20.0 tons	+ 20 units
3.	Crab crane 3.0 - 40.0 tons	+ 15 units
4.	Bridge or gantry crane 5.0 - 20 tons	+ 8 units
5.	Monorail crane	+ 10 units

Sales Trend

Rapid growth-backlog of orders-recently moved into new plant: $0.5 million in 1976-$1.6 million in 1977.

Problems

Wish to standardize designs, install inventory control system, reduce back-order problem on motors and other components, install quality control program for purchased components, set up storage bins for storeroom, improve production methods and work flow, and develop jigs and fixtures for more efficient production.

Production Cycle

Production is by order only, as follows:

1. Order is received.
2. Crane is designed and specifications are prepared.
3. Customer approves design and specifications and pays 10% down.
4. Four sets of drawings and specifications are prepared, one for each of following sections: production management, machining, welding and cutting, and site erection.
5. Production management section prepares production schedule and materials and components list and informs the machining, welding, erection, electrical, and procurement sections of dates when each component or material is needed.
6. Production then begins, but delays occur due to back orders by suppliers.
7. Production is finished and equipment is inspected.
8. Equipment is disassembled and shipped to site.
9. Equipment is erected at buyer's site.
10. Buyer pays 90% of purchase price.

Present Inventory Control System

They have none. A bill of material explosion must be done for each sale. They use 400-500 items, which are all purchased in Korea. Very few of these are kept on hand in any depth, and apart from taking a physical count, they don't know how many of any one item is on hand.

Mr. Shinn says that they can't predict annual sales by size of crane in order to order items in advance. Working capital costs 19.5% and is hard to obtain.

Second Visit, July 28, 1978, Malvar and Lodge

We reviewed plans for a 5-ton, 19-meter overhead crane. Frank discussed the preparation of standardized drawings in order to reduce drafting time and lessen the chance of errors. These drawings would be done in ink on mylar sheets, leaving off any dimensions which might change from job to job.

This crane has 30 sheets of drawings, roughly 2-3 weeks of drafting work. Frank estimates that this could be reduced to 2-3 days of drafting, once the standardized drawings are completed.

Upon learning that the copy service which they use can't copy from copies, Frank proposed several alternatives:

1. Ink on mylar, without dimensions. Pencil in dimensions for specific job on mylar, and make four copies.

2. Ink on mylar, without dimensions, copy four and add dimensions for specific job on each copy.

3. Ink on mylar, without dimensions. Trace mylar four times and add dimensions onto each.

4. Ink on mylar, without dimensions. Copy four of each of the large sheets and add dimensions. On the small detailed drawings, trace these four times.

The firm does not have a copying machine. They should investigate the purchase of a blue line machine such as we saw at International Electric Company, the Elite 800, which cost about $500 when purchased last year.

Frank drew up a list of material format, to be included on each drawing, as follows:

LIST OF MATERIAL

Material	Type of Crane 25T	20T	15T	Current Unit Price	Total Price
Nuts, 1"/ x 3"/4	200	190	180	W 2	
Grand Total of Material Used					

Third Visit, August 7, 1978, Lodge

Met with Mr. Hong. Mr. Shin was absent. I presented the recommended inventory control system and Mr. Hong read it through. He said that he liked it, but the problem is that the suppliers don't ship on schedule. I told him that the perpetual record cards would show them common items and number and frequency of purchases so that in the near future they might be able to order some items in advance. I also said that we could see no solution to the problem of delays in receipt of materials, other than to stock parts in advance of orders.

He requested data from U.S. crane companies; such as:

Number of employees
Organizational charts
Process flow through the plants, etc.

I pointed out that we would bring in an industrial engineer to assist on these problems, rather than trying to fit another firm's solution to his problems. He would still like the IE to bring this information with him. I said we would try to locate available materials, but the contract didn't provide for that type of research from U.S. companies, nor did I think the U.S. companies would provide much of it to GIT for his use.

Mr. Hong then brought up their lack of any ABC analysis. He also said that they are building stock shelves and were wondering how to arrange the items on the shelves; by weight, prices, or how? I recommended putting heavier items near the floor and the light items on the high shelves. Also suggested putting frequently used items near the stockman's normal reach. Mr. Hong thought he should use ABC analysis to determine how to arrange stock on the shelves.

I asked whether the firm has given any thought to adopting the standardized drawing concept as presented by Frank Malvar during our last visit. Mr. Hong said that they have begun to standardize drawings for a 5-7.5 ton overhead crane. It will take them a month or more, as they must work on this in between contract work.

He would like some reference materials on standardized drawings, so that they can imitate them.

I gave Mr. Hong the name of the Elite 800 blue line machine and suggested that they consider purchasing such a machine.

I told Mr. Hong that we would have a man in Korea later to assist him with his other requests -- improving production methods and work flow, developing jigs and fixtures, and setting up quality control for purchased components.

Appendix 3

INTERNATIONAL ELECTRIC COMPANY, LTD.

Contacts:

President, Hyung-do Kang
36 years old
MA, EDPS
University of California

Production and Technical Manager
Wan Eui Yook, EE, SNU
Speaks good English

Present Employment: 150

Product Line

5-5,000 KVA transformers with the main product being 5-100 KVA pole transformers.

New Product Development

Wishes to develop or license designs to manufacture dry-type nonexplosive transformers, switching gear, conveyors and hoists for domestic underground coal mining. These items are also used in chemical plants and on naval vessels.

There are many coal mining companies in Korea, the biggest of which is Korea Coal Corporation, a state-run organization. There are few companies in Korea making mining equipment, according to Mr. Kang, and none produce explosion-proof transformers. He does not know how big the market for nonexplosive dry-type transformers is, but believes that the size and timing of that market are dependent on how soon the Korean Ministry of Energy and Natural Resources places emphasis on and funding into the use of these devices. Mr. Kang has tried to discuss this with the Ministry, but has been unable to get any information from them. He needs to see the government plan for mine safety.

The Ministry wants him to buy expensive testing equipment from Japan before they place money into a mine safety program. He doesn't want to purchase the testing equipment until the Ministry is ready to budget money for the purchase of the explosion-proof transformers. He already has some national financing lined up for the test equipment.

He doesn't think that he will need much additional manufacturing equipment to produce the dry-type units. He knows that class "H" uses mica glass and silicon varnish, but he knows nothing about these materials or processes. A class "C" transformer could be used (maximum temperature of 105° C), but these are more expensive to produce than the "H". These standards are set by the IEC, or International Electrotechnical Commission, located at 1 rue de Varembe, Geneva, Switzerland. NEMA in the U.S. is a member, so probably can furnish specifications, if GIT library doesn't have them.

He wishes to produce 30-500 KVA dry-type class "H" 6,600 volts primary to 440 or 220 secondary, 60-cycle transformers.

He has had some contact with a small Japanese firm which produces this equipment. The president of that firm is to visit Korea, but ROK doesn't want further dependence on Japan -- wants him to find U.S. or other nationality help.

The firm also has a Korean professor working under a $20,000 government grant, trying to design this unit, but Mr. Kang is not optimistic about this program.

Heat control or transfer seems to be the key, since there can be no openings in the casing and no oil for cooling.

Mr. Kang contacted the Hawker Siddley Group in the U.K., but they wanted $30,000 down and $20,000 per year for ten years plus a 5% royalty. By Korean law, a small firm is limited to paying $30,000 down plus a 3% royalty for three years. He has asked us to seek an American firm which would license the design for this price.

I have already (7-27) written Dick Johnston regarding this, and also regarding whether anyone on campus could design for that price.

He has tried to locate a retired American engineer to assist him on general transformer design problems. SCORE had found a man, but he was unable to come to Korea because his previous employer (Westinghouse) already has a license in Korea. Mr. Kang would pay travel and living expenses. SCORE is now trying to find another man.

Mr. Kang wants us to measure the market for explosion-proof transformers and other mining equipment. He believes it will be a relatively small market, suitable only for a small firm such as his.

Of much lower priority is his garbage disposal. He brought three units back from the U.S., pirated the design, and subcontracted the parts out for 100 units.

He has four problems related to this disposal:

1. To gauge market potential in Korea
2. To eliminate reliability problems
3. To determine how best to handle sales and servicing
4. To determine equipment needs and costs of production

The apartment and single-family house builders or developers whom he has contacted see no need to spend money on additional kitchen appliances when their homes are selling as fast as they can build them. When questioned about the institutional market, he said that this would require a larger disposal unit, which is true.

Mr. Kang wishes to know whether there is a market in Korea for the disposal unit. I suggested he try a very selective test ad, reaching only the upper income groups, but he is reluctant to advertise because of the cost and a fear that he will alert a larger firm to the potential of this product.

Mr. Kang believes that at present disposals are being mass marketed only in the U.S. and U.K. He wonders if there must be a certain income level before a country becomes a market for disposals.

His present selling price is 38,000 Won, or US$75.00. He is reluctant to try to export these units, as he realizes there will be servicing problems and he doesn't want to become dependent on export markets. But there is a firm in Singapore that is interested in marketing this unit there.

Mr. Kang gave friends and relatives some 20 units to test. When the units get stuck on pieces of bone or cutlery, the maids don't understand how to clear the units and reset the circuit breakers. Also, the units shake the entire sink, due to the fact that the flexible PVC sewer pipe which they use here is not rigid, as is the traditional copper or cast iron pipe, and it allows the unit to vibrate.

Mr. Kang subcontracted out the production of his 100 test units, but should the market prove feasible, he wishes to add production facilities to

produce them is his plant. He wants to know what machines will be needed and how much they will cost.

Plant Layout

The plant, which they have been in for about one year, is crowded in some areas and needs some additional materials-handling equipment. A large expansion is now under way alongside the existing building.

Second Visit, July 29, 1978, Lodge

At Mr. Kang's request, Mr. Lee, Mr. Park and I revisited this firm. Mr. Kang wished me to be present at a meeting with Mr. Yukihisa Maeda, the president of Maeda Electric Manufacturing Company, Ltd. This firm is one of four in Japan which makes explosion-proof transformers, motors, and switch gear for mines. Located in Saporo, it sells 120 million Yen worth of this equipment in Japan yearly. The four Japanese firms all fall in the 150-160 employee class.

Mr. Maeda said there would be no problem in teaching this Korean firm how to make class H transformers.

Mr. Kang still wants GIT to conduct a search for expertise or an American firm which would be willing to license to Mr. Kang's firm.

Mr. Kang also told me that the Korea Coal Corporation has just published a tender for 30 sets of class H transformers.

Third Visit, August 8, 1978, Lodge

Per Executive Director Kim's suggestion, I asked Mr. Kang whether they had applied for a Korean patent. He said that they had, and it should be known in about a month whether the patent would be granted. But, he said, another firm could make minor changes and get its own patent, so this is really no deterrent to having the product idea stolen.

At this time Mr. Kang believes that he should wait with further marketing of the disposal until he has stabilized the transformer business. He agreed with me that the market survey could best be done by a Korean. I told him I was recommending that the Fund put their market consultant on this work.

I also asked how the selling price of the disposal had been set. He used a formula used for setting transformer prices, with material costs equaling

one half the selling price. He does have a breakdown of estimated costs, though I did not see it.

Regarding the problem of vibration, he said that PVC flexible tube was standard drainpipe material. They used a tripod-like bracket between the disposal and the floor, and this did reduce the vibration problem.

He asked that GIT seek sources and prices on U.S. overcurrent relays for 200 volts, to protect 1/2 hp motors rated at 4 amps + 1,60/50 Hz. Texas Instruments has one, but it is too expensive.

He asked that GIT determine machines needed and prices for production of 10,000 units per month. He wants a fully automated line if this quantity will permit. Wants to use an automatic coil winder which pinches the core, welds it, winds the coil, inserts the coil, etc.

I told him we would also seek out a potential licensor for the class H transformer.

Appendix 4

SEOUM ELECTRONIC COMPANY, LTD.

Contacts:

President, Mr. Um ("Uhm")
46 years old
Teachers College, SNU; and Graduate School of Administration, Dong-guk University
Speaks fairly good English, but may start interview with stranger via Korean
Inventory control is in charge of Mr. Choi, whom I did not meet as he was away on military training this day.

Present Employment: 294

Product Line

Nine models of stereo receivers

Nine models of stereo amplifiers

Six models of tuners

Problems

Seeks U.S. buyers and a better inventory control system.

Marketing

They have experienced a very rapid growth in sales and recently were awarded a national exporting award by the government. They produce private brands only. Their buyers come to them in Korea. Because of their reputation, new buyers are referred to them by their present customers. Their production lines are kept busy by present orders. Customers report less than 4-5% returns or complaints. They used to supply Olsen Electronics in the U.S.

At present 100% of sales go to Europe, but they would like to expand to include 30% sales to U.S. in the future. Therefore, they request that GIT provide a list of potential retail outlets in the U.S.

They produce quality merchandise; a high-priced line:

About $400 for receiver, 40 watts at 8 ohms guaranteed, measured at 0.02 thd (total harmonic distortion)

$220-300 for amplifier

$220-300 for tuner

Their German buyer sells by mail, which might be done in U.S. via American Express or other credit card companies.

Productivity

In 1977 they required 14 hours, 47 minutes of production time per receiver, while in Japan it required only 6 hours. Now they have their time down to 9 hours. The problem lies in parts and material shortages which shut down the line.

An example of the type of problem: after the units are wired, they are put into their cases. However, at times there are no cases available because they lack certain materials.

As a result of shortages, their direct labor costs are running 65% over the expected figure.

Why can't they get materials? Because of the variety of parts required by the various models. Each requires about 1,000 parts. Korean law dictates the amount of inventory which can be carried, based on volume of sales.

Color requirements for wire, panels, panel fronts, knobs, etc., further increase the problem. Colors on panels and fronts frequently do not match previous orders from the same suppliers, causing problems in matching materials when assembling. They purchase 35% of parts from Japan, and these don't always get shipped on time. Korean parts don't always meet quality control requirements, causing shortages until additional parts arrive. The firm orders too few parts from any one supplier to get preferred customer treatment.

The Japanese suppliers are stalling on shipping orders to get a better exchange rate, as the dollar (and the Won) continues to fall.

Inventory Control

At this point, I questioned whether they really expected to correct the above productivity problems with an improved inventory control system. Mr. Um said that they wanted an inventory control system which would be better than their present system, but below a computerized system.

They have done an ABC analysis and designated some parts as special or A (transistors, integrated circuits, front panels, dials, scales, meters, etc.), C (screws, eyelets, and other common hardware), and B. They try to buy from

one supplier, but sometimes price dictates the use of another. They have not set up their own code system for parts numbers. Instead, they use the supplier's code numbers on the parts lists. For mechanical parts, they use their own drawing numbers. In cases where more than one supplier may be used, alternate parts numbers are shown on the parts list.

Their present inventory system works as follows:

1. An order is received; minimum quantity is 500 units/per model, except that colors may be mixed.

2. Engineering Department issues parts lists to Purchasing, Business, Production, and Quality Control departments.

3. Purchasing Department begins contacting suppliers.

4. As orders arrive, the parts are received and tested by Quality Control Department. Total test of some, sampling of rest.

5. Accepted parts go to warehouse, where Purchasing counts out parts according to the parts list and then supplies parts to Production Department according to the production schedule.

Bins are used for the electronic parts, with a perpetual in/out inventory sheet hung over each bin.

Customers are promised shipment of units 120 days following order confirmation. Parts are not ordered until customer confirms. They make no attempt to forecast sales ahead of receipt of orders. U.S. MA #105 is used for QC level.

Second Visit, August 10, 1978, Lodge

We met with Mr. Choi, who is a director in charge of production and inventory control. President Um was not in the office today.

I informed Mr. Choi that the Fund would shortly provide the company with lists of major U.S. department stores and firms importing stereo components into the U.S.

We then moved onto a discussion of the firm's inventory control problem. There is more of a problem here than President Um indicated during our first visit. The problem is caused by:

1. The fact that the firm produces custom orders, with but 120 days allowed from issuance of a letter of credit by the buyer's bank until delivery of the merchandise.

2. The wide variation in number of models, number of units to be produced, and the number of different parts in each model.

3. Tight government controls and extensive red tape involved in getting an import license prior to being able to order parts from Japan. It takes roughly a month from receipt of customer's L/C until parts arrive from Japan.

The firm, according to Mr. Choi, wants to find a faster and more accurate way to prepare the extensions of the numbers of parts needed per unit than by using desk-top calculators. Yet Mr. Choi doesn't believe that the firm can afford to go to the installation of a computer -- not even a microcomputer with, say, a floppy disc for storage of programs. I believe GIT should seek out both an alternate method of doing the calculations, as well as get price and memory capacity data on microcomputers. Each model number would have its parts explosion or parts list put into the memory of the microcomputer. Then when an order is received, the total number of units per model would be entered in the microcomputer and the output would be the total number of each part required to produce the ordered quantity.

In Korea, in order for a firm to order components or parts from an out-of-country supplier, the following procedure is necessary:

1. Order and letter of credit (L/C) is received from customer.

2. A parts requisition list is prepared and submitted to the local governmental unit, along with a pilot model of the item and a wiring schematic. Once the pilot model and schematic have been submitted on a new model, only the parts requisition list is required.

3. A parts requisition list is also sent to each foreign supplier. They, in turn, send the Korean firm offer sheets, quoting prices for each item.

4. An import license application is submitted to the firm's bank. The bank must match this up with the papers on file with the local government before approval can be given.

5. When the import license (I/L) is approved, the firm can apply to its bank for a L/C for each foreign supplier.

6. When the foreign suppliers receive their L/Cs, they ship the parts, assuming the parts are in stock and that the foreign suppliers don't hold the shipments to get a better exchange rate.

These procedures require many calculations for each model order. Mr. Choi says that the Japanese electronic firms use computers for this task, but they are much bigger and can afford computers.

GIT might also explore the possibility of time sharing in the Seoul area. Is anyone doing it now? Is anyone interested who has a computer? I suspect there are many firms which could use some computer time.

Finally, Mr. Choi would like some assistance in the development of fixtures for use in the mechanical assembly of the stereo units.

Appendix 5

JOONGWON COMMERCIAL COMPANY, LTD.

Contact:

Director, Mr. Dong-Hyun Kim
37 years old
Electronics Department
EE, Seoul National University

Present Employment: 160

Present Product Line

Micro cassette recorder

Mini cassette recorder

Portable cassette recorder (3 models)

Four-band radio cassette recorder

Stereo cassette deck

Stereo receiver

Problems

Needs assistance with case designs for U.S. market. Thinks U.S. may have better inventory control system.

Design Needs

Needs contemporary design for case and controls of four-band radio cassette recorder and portable cassette recorder for U.S. market. Competitors change styles yearly, but if he copies, he is always one year behind their designs. He has thought of using an industrial designer in the U.S., but is concerned about terms of contract, paying in advance for design work that they may not like, and that final design won't sell.

Inventory Control

Their system is similar to Seoum Electronics, except the perpetual data are kept on Cardex cards in a central location. They have a parts list of each model. He couldn't identify any problems with the system, but feels there may be a better system in the U.S. -- something just below a computerized system. They don't order parts until an order is received. Copies of purchase orders go to:

Supplier

Procurement Department

Raw Material Control Section

Accounting Department

QC Department

When items are received, QC tests these and copies of the test form go to:

Supplier

QC Department

Procurement Department

Accounting

Number of parts, by model:

Four-band radio, 450 items

Portable cassette recorder, 701 and 705, 170 items

Portable cassette recorder, 701 R, 320 items

Micro cassette recorder, 120 items

Mini cassette recorder, 120 items

There are a number of different models, due to differences in:

Line cords

Transformers

Jacks

I suggested that he consider a model designed to meet any and all national standards, but he thought that would cost more than the reduced inventory costs and savings which would accrue from fewer production line stoppages due to parts shortages.

Production Line

Looked good to me, but it would be good public relations for Dr. Fyffe or other IE to stop by. They assemble from purchased components, with some 80% of the value of the components coming from Japan: tape drives, reel driven, are Japanese and come completely knocked down.

Marketing

They produce private brands only. U.S. customers are:

Yulsan American, Inc., "Entertainer," micro cassette recorder

Fortune Star Co., "Mekka," portable cassette recorder

International Bonded Warehouse, "Seikotron" and "Elektrophonic," 701R portable cassette recorder with AM radio

They recently engaged a manufacturer's representative in New York. The firm advertises in:

Asian Sources magazine

Korean Electronic Buyer's Guide, an annual directory

Catalog of Korean Electronics, an annual directory

Electronic News, Korean magazine

Everything but the radios is designed for the low-priced market. The four-band radio is a middle-price item and sells for 15-20% under Japanese models. Competition for other items is in Hong Kong and Taiwan.

Minimum order is 3,000 units or more; varies by item.

Current FOB factory prices are as follows:

Four-band radio JC-801, $41.00 for 5,000 or more
Micro Cassette JC-201, $17.50 for 10,000; $18.00 for 2,000
Mini Cassette JC-201, $17.00 for 10,000 or more
Portable Cassette JC-701, $13 00 for 5,000 or more
702, $13.15 for 5,000 or more
701 R, $15.00 for 5,000 or more
Stereo Cassette Deck JC-901A, $38.00 for 3,000 or more
Stereo Receiver JC-1,000, $39.00 for 3,000 or more

The micro cassette recorder is exported only into the U.S. The portable cassette recorders (701,705, and 701R) go 40% to U.S. and 60% to Europe. The four-band radio was designed for the European market, but they are interested in redesigning the case for entry into the U.S. market.

Video Tape Recorder (VTR)

Since requesting assistance from the KCGF, they have learned that they can't hope to get a license from either Sony or Grundig for several years. Licenses are available only to large firms. He hopes that they will be able to

begin manufacturing under a license in 1983-85. He is aware of the complexity, quality requirements, and need for a "clean-room" plant for such a product.

Mr. Kim agreed with me that it is far too early to begin either market or technical feasibility studies, since too many assumptions must be made.

Second Visit, August 4, 1978, Lodge

Mr. Kim said that he has no preferred U.S. location for an industrial designer, since all contacts will be via correspondence, telephone or cable.

Marketing Problem

When asked if the firm had any other problems which GIT might work on, he mentioned marketing. He is seeking more U.S. buyers or a bigger-volume buyer for his recorders and the four-band radio. He is also interested in a joint venture with a U.S. firm to produce components or complete products. Mr. Lee mentioned the KCGF trainee's visit to the Lanier plant in Atlanta and wondered if Lanier would be interested in a parts contract.

Mr. Lee said that the Fund would like GIT to provide a list of U.S. firms who are interested. I said I didn't think GIT wanted to become involved in actual sales or qualification of potential customers.

Mr. Kim would like to reach any major firms -- retailers or wholesalers -- who don't have buying agents or buyers in Korea. These would be firms such as Emerson Electronics or Midland Electronics, but they both have buying agents in Korea. He said that the large U.S. department stores all have buying offices in Korea.

Mr. Kim said that the Korea electronic firms don't use sales agents in the U.S. as they can't afford the commissions. Instead, they sell through buying agents of U.S. firms, which firms pay the buying agents commissions.

Mr. Kim has two men under him who handle sales, contact buying offices and agents, and write letters to companies in other countries.

Third Visit, August 10, 1978, Lodge

Began by asking Mr. Kim if he could provide further information regarding the Midland company, which he had previously mentioned -- a full name or geographic location to aid me in finding the company in Dun and Bradstreet.

He was unable to do so beyond telling me that it was an importer rather than a manufacturer.

I told him that the Fund would shortly mail him a list of importers of cassette recorders into the U.S.

We then discussed his interest in a joint venture with the Lanier Company, which has a plant in Thomaston, Georgia. He is planning to develop a new product, a telephone answering device, next year. Lanier presently makes such a unit. Lanier now gets some components from Canada and Japan.

Finally, Mr. Kim requested assistance in the improvement of his assembly lines. Perhaps some automation? He also asked if GIT could help him to determine how many people he would need to produce 500 cassette recorders per day. How much time is required in a U.S. factory to solder one connection? He would like to compare his assembly operation with a typical American plant.

Appendix 6

HYANDAE BOTTLE MANUFACTURING COMPANY

Contact:

President, Mr. Ki Sung Nam

Present Employment

215, with three production shifts of 22 per shift

Present Product Line

Glass bottles in 50 to 100 cc sizes

Marketing

This is a subsidiary of Dong Hewa, the fifth largest pharmaceutical company in Korea. They presently produce 60% of Dong Hewa's bottle needs, but next year will be able to produce only 50% of Dong Hewa's growing needs. All but one of Korea's bottle producers (Ohn Sung Glass Company) are captive plants. The captive firms are:

1. Hangok Glass Bottle Company, owned by OB Beer, which also bottles Coca Cola.
2. Daehan Bottle Glass Company, owned by OB Beer
3. Chosun Glass Company, owned by Jinro (Soju wine)
4. Yon Hap Glass Company, owned by Dong Ah Pharmaceutical Co.
5. Tong Suh Glass Company, owned by Crown Beer
6. This plant, which is owned by Dong Hewa

Problem

To meet increasing demand, this firm has purchased a 7,000-pyong site, on which a new integrated bottle and pharmaceutical packing plant will be built. Plant construction will begin as early in 1979 as the weather will permit. They could give me no site dimensions, as it is now being surveyed.

They wish to automate as much as possible; especially in:

1. Raw material warehouse
2. Bottle-forming machines

3. Bottle inspection

4. Bottle packing

Their wish to automate stems from ever increasing wage rates in Korea (up 20% in 1977 over 1976 and expected to increase by 40% in 1978 over 1977) and because they are having difficulty getting workers to work in their present hot, dirty, noisy and dangerous plant.

Presently sand, scrap glass, and soda ash go to the mixer by shovel and wheelbarrow. Inspection and packing of bottles into cartons are done by hand.

The new plant is to produce 500,000 to 600,000 bottles in sizes ranging from 30 cc to 100 cc.

They want data, including prices, on U.S. bottle-producing equipment; IS machines (individual section); baby IS machines for 100 cc and less. Also data and prices on all ancillary equipment, including machine shop and stack emission cleaners.

The new plant will require pure glass, x tons per day. This can be derived from daily capacity of 500,000 - 600,000 and following bottle weights:

100 cc bottle - 115 grams weight of glass per bottle
60 - 86
50 - 72
30 - 52

They want to install more safety equipment, lower the air temperature in the plant, and lower the noise level.

Environmental standards in Korea get stricter every year, so they asked for equipment designed for U.S. requirements.

The present furnace exhaust is 400°C (working interior temperature is 1500°C), and they wish to utilize stack gases from the new furnace to dry the silica sand.

Silica sand and bunker C fuel oil are trucked in. Air-slide type tank trucks are used in Korea now and could be used for the new plant.

At present, fuel oil costs equal 18% of gross sales. Can this be reduced? They want to install electronic heat controls in the new furnace.

Warehouse must be sized to hold 20 days' production.

I was given present plant and furnace drawings.

Appendix 7

SAM MOCK KANG-UP CO., LTD.

Contacts:

Director, Mr. Chang Il, Kim
Managing Director, Mr. Jong Jin, 49 years old, son of the president

Employment

165, including 36 in the office

Product Line

Automobile and railcar truck springs, coil and leaf

Marketing

70-75% OEM, with some exported

25-30% replacement or after market

Problems

Firm hasn't been able to meet OEM specifications for life cycle test from either five- or two-leaf automotive springs. Also unable to meet dimension specifications on two-leaf spring. Management believes problem of life cycle may involve heat treating, although it is satisfied with hardness tests of its products.

Heat Treating

They use SAE 5160 spring steel, 6-15 mm thick. Heat treating involves quenching temperture of 850°C, using Oil Voluta #27, a Shell Oil product. Quenching heating time is 15 minutes. Quenching oil temperature is 80°C. Tempering temperature is 500°C for 45 minutes, followed by rapid cooling with water of unknown temperature.

They are getting a Rockwell scale hardness of 58 minimum after quenching and a $\pm$ 40 after tempering.

On the five-leaf spring, the car manufacturer wants a 200,000-cycle life test, but the firm can only get 150,000 cycles. A cycle is one deflection from minimum to maximum.

The two-leaf spring is also to be rated at 200,000-cycle life test.

Design Problem, Two-Leaf Spring

The car manufacturer, Hyandai, needs a two-leaf spring for its Pony car. Hyandai has provided a drawing for this spring. A copy was given to Lodge to bring to Atlanta.

The spring has an unusually long taper to the leaves, 400 mm long compared with 200 mm on the five-leaf spring. The firm puts this taper in the leaves by heating them and then running them through a roller press. On the leaves of the five-leaf spring, the excess material moves to the ends of the leaves and the width of the leaves remains the same. But with the longer taper, some of the excess material bulges out the width of the leaves at the ends, and the width becomes 55 mm rather than the required 50 mm.

I suggested several alternatives during this visit. Removing excess material from the sides before or after rolling would be too expensive, either by grinding or shearing, according to the management. Adding side rollers to the roller press was rejected as requiring a totally different machine, one which the Japanese had stopped using some years ago. I am not convinced that side rollers couldn't be added to the existing machine at a reasonable cost.

This plant is the second largest of six in Korea which produce automobile springs. The largest firm is very large and has a modern plant. The other four are very small. This plant is labor intensive, with old machines and little materials-handling equipment. I suspect that in order to compete, both in terms of quality and price, this firm needs a more modern production line.

Appendix 8

DONG SUNG MACHINE INDUSTRY CO., LTD.

Contact:

President, Mr. Ihu Soo, Kim
Professional Engineer, Mr. Ki Yong, Chae

Product Line

Battery-powered locomotives, mine cars, car tippers, mine conveyors, vibrating screens, and impact crushers.

Problems

A new plant will be constructed on a 4,800-pyong site; construction will begin April 1979. They are adding belt conveyors to their product line, having been designated by the government as a specified conveyor manufacturer just this year. There are four such specified companies now in Korea. The new plant has not yet been designed.

Management has suddenly decided that it is ready to accept technical assistance from GIT. They requested GIT to provide:

1. Assistance with mass production of conveyor belt. Will probably require some automatic or semi-automatic machines.

2. Assistance with quality control for the carrier rollers.

3. Assistance in locating a U.S. firm which will license conveyor designs. They believe it will have to be a small firm or designs will not be compatible with their production methods. They can pay no more than $30,000 down plus 3% royalty for three years, under Korean law.

EXTENSION SERVICES TO THE KOREA CREDIT GUARANTEE FUND

Annual Report
(April 26, 1978 to April 25, 1979)

by

Ross W. Hammond

Office of International Programs
Engineering Experiment Station
GEORGIA INSTITUTE OF TECHNOLOGY
Atlanta, Georgia 30332, U.S.A.

Table of Contents

Foreword and Acknowledgments

This first annual report on the services provided by the Georgia Institute of Technology in a cooperative program with the Korea Credit Guarantee Fund is the result of the work of many individuals from both organizations.

The Georgia Institute of Technology wishes to express its appreciation for the diligent and cooperative attitude shown by many KCGF administrators and staff members. In particular, thanks go to the following individuals, without whose assistance this cooperative program would not have been possible:

Chairman and President Jae Chull Chung
Executive Director Youn Jai Kim
Mr. Yong Tae Sohn, Manager, Extension Service Department
Mr. Ho Jin Kim, Extension Service Department
Mr. Un Young Lee, Extension Service Department

Many others, too numerous to name, also were of assistance, and their contributions to the success of the program are gratefully acknowledged. It should be noted that Dr. Yoon Bae Ouh, of Soong Jun University, was extremely helpful in the project activities and coordination.

This program depended, in part, on recommendations by KCGF and Georgia Tech to selected companies for improvement of their operations, methods, processes, or products, with the aim of strengthening the companies. In most cases, the companies accepted and utilized the information provided and the improvements suggested. In some cases, for a variety of reasons, the assistance could not be utilized.

This is normal in a technical assistance program. Several of the companies indicated their satisfaction with the program, enough to suggest that the program was successful and could be profitably continued.

Ross W. Hammond
Office of International Programs
Georgia Institute of Technology

Annual Report

EXTENSION SERVICES TO THE KOREA CREDIT GUARANTEE FUND

Background

In 1977, Chairman and President Jae Chull Chung of the Korea Credit Guarantee Fund (KCGF) visited the Georgia Institute of Technology (Georgia Tech) in Atlanta, Georgia. He was accompanied by Mr. Youn Jai Kim of KCGF and others. An agreement to develop cooperative programs was signed by Chairman Chung for KCGF and Dr. Donald J. Grace, Director of the Engineering Experiment Station, for the Georgia Institute of Technology.

Further discussions were held in Seoul by representatives of both organizations, and a suggested cooperative program of work was developed.

In April 1978, Chairman Chung again visited Georgia Tech, and on April 26, 1978, a contract was signed between the Korea Credit Guarantee Fund and the Georgia Institute of Technology. The contract provided for Georgia Tech to work cooperatively with the Extension Services Department of KCGF to provide training, technical information, and management and technical assistance to members of the KCGF staff and to industries selected by KCGF.

During the contract year, three detailed quarterly reports were presented to KCGF management describing the activities and services rendered by Georgia Tech. This annual report summarizes the activities and the results which have been achieved under this cooperative program. Appendix 1 shows the details of the KCGF Training Program held at Georgia Tech. Appendix 2 contains a summary report of project activities. Appendix 3 contains details of the nature of assistance provided to individual companies and the results obtained during the year. In Appendix 3, companies are identified by letter (A, B, C, etc.) rather than by name to protect confidential information received from the companies.

Summary of Activities

The broad program of activities consisted of three major components, as follows:

Training, both formal and informal

Technical information transfer

Direct management and technical assistance to companies

These activities are discussed in detail below.

1. Training

A formal training program was conducted at Georgia Tech from May 22 to June 16, 1978. This specially designed training program on industrial extension principles and techniques was attended by four KCGF staff members: Mr. Ho Jin Kim, Mr. Un Young Lee, Mr. Jae Sool Park, and Mr. Gol Sik Min.

Three weeks of training were conducted in Atlanta; this time was spent in classroom work and visits to two Atlanta banks, the Small Business Administration (Regional Office), and the Small Business Development Center, located at the University of Georgia in Athens, Georgia. The fourth week of the program involved visits to four industrial extension field offices of Georgia Tech and visits to twelve industries which had received technical assistance from Georgia Tech. This training included presentations by nine faculty and staff members. (See Appendix 1.)

It is believed that this formal training program is important for KCGF service personnel. Georgia Tech pioneered industrial extension services in the United States and its personnel have a long history of successful problem-solving work with thousands of companies in the southeastern United States and in many countries. Although it is impossible to train people in a four-week program to be knowledgeable about every industry, the exposure to the methodology and techniques used can be extremely helpful to the KCGF staff in future work with industry.

Informal training of KCGF personnel also was provided during the periods when Georgia Tech personnel were at the KCGF offices in Seoul. This "on-the-job" training resulted during participation in company visits, discussion of problems and solutions, and review of the technical information which was provided to Korea companies. Because this training dealt with actual problems of Korean companies and was conducted over a longer period of time, it was an especially important activity.

2. Technical Information Transfer

On the assumption that technical information was needed on a variety of subjects, a considerable effort has been made to transfer technical information

to Korean companies under the contract. This effort was directed by Mr. Richard Johnston of Atlanta.

The methodology used was as follows: Generally requests for technical or trade information, product brochures, industry standards, new process or product data, etc., were received during visits to factories by KCGF and Georgia Tech personnel. If such requests for information could be answered by Korean information and technical organizations, these sources were approached first. Frequently, however, it was necessary to contact the Georgia Institute of Technology in the United States to obtain the necessary technical information. This was done in writing or by telex. Such information requests and responses generally took from four to six weeks of time before the needed information was received at KCGF and ready to be delivered to the industry. This delay was not critical since the company receiving the information usually was not prepared to act on it immediately.

An essential part of the technical information transfer process was the delivery of the material to the company. Frequently, the information had to be explained to the company management or production staff. Sometimes it was necessary to point out the ways in which the data could be utilized by the company. These things required understanding and communication skills on the part of the KCGF and Georgia Tech staff. (In general, delivery of technical information to a company without discussion of the material and its applicability to company problems or needs, is not productive and should be discouraged.)

During the course of the year, approximately forty different technical information packages were developed and presented to ten companies which were being assisted. These information packages consisted of manuals, books, reports, technical articles, manufacturers' brochures, lists of American companies, and similar materials useful to Korean companies. In some cases, the information packages contained a number of different items. The types of information delivered to Korean companies are listed in the individual company reports in Appendix 3.

As part of the technical information transfer activity, a number of visits were made to organizations in Seoul to obtain locally available information and/or assistance. These organizations included Soong Jun University, the U.S.

Embassy Commercial Library, The Korean Federation of Non-Ferrous Metal Industries Cooperative, Seoul Chamber of Commerce, and welding supply companies. Attendance at a machine tool show yielded product information useful to the companies that were being assisted by KCGF. This activity provided information and assistance and opened lines of communication between KCGF and the organizations visited. It also made other organizations aware of the KCGF extension service activities.

Generally speaking, the provision of technical information under this program was well received and appreciated by the companies. In a few cases, however, the information appeared not to be studied or utilized by the companies. In one case, the factory employee who received considerable needed technical information and data on welding made no use of the material and indicated he had no intention of introducing such a "radical" change (it was pointed out that the process was old in the United States 15 years ago). In other cases, the information was immediately studied and utilized.

3. Direct Management and Technical Assistance

The major part of the activity under the contract was the provision of direct management and technical assistance to Korean industries which had been selected by KCGF.

Under this phase Georgia Tech personnel spent the balance of the contract time in Korea working closely with KCGF personnel. Donald Lodge, Robert Rice, and Ben James were on site for six weeks each, and Ross Hammond, Nelson Wall, and Frank Malvar assisted for shorter periods of time.

During this activity a total of 62 plant visits were made to a total of 15 companies. Four of these were preliminary visits to companies to be provided assistance during the second contract year.

The general procedure for these company visits was as follows:

a. Preliminary Meeting. KCGF would schedule an appointment for KCGF technical personnel. This meeting usually would be held at the company factory, where the manufacturing operation could be observed. First, company management would discuss the company's background, products, processes, and other pertinent material. An inspection of the manufacturing facilities would follow, with a discussion of the company's technical problems and needs. Where appropriate, suggestions for production improvements would be made

immediately. A final session reviewed technical areas where assistance or information would be helpful.

b. Second and Subsequent Meetings. As soon as relevant information was available or assistance ideas were formulated, KCGF would schedule one or more subsequent visits to the company. KCGF and Georgia Tech would present the information or technical assistance concepts to the company, utilizing detailed explanations, sketches, calculations, or whatever was needed to permit management to give consideration to the recommendations.

As a procedural matter, it was suggested that Extension Service Department personnel of KCGF check back at six-month intervals with the companies which had been provided information and assistance in order to determine, first, what actions had resulted from the recommendations and, second, if there were additional problems or needs. This check, which can be done by telephone, allows KCGF to ascertain whether or not additional plant visits are needed.

The nature of the technical assistance provided to these companies was extremely varied. The individual company write-ups in Appendix 3 cover the types of assistance provided to each company.

However, a partial list of the types of assistance and information provided to the 15 companies is included here to show the scope and variety of these activities. For the sake of convenience, this list has been divided into three main categories: technical assistance and information; management assistance and information; and supply, marketing and licensing information.

Technical Assistance and Information

- Design of material-handling box and method of using
- Design of tote box for moving parts
- Method of combining drilling and deburring
- Development of standardized drawings and list of materials
- Information on jig and fixture design
- Design of PERT network for manufacturer
- Data on welding processes
- Information on aluminum welding
- Calculation of tool count by weight (rather than individual count)
- Assistance in repair of iron castings

- Advice on machine tool speeds and feeds
- Drill-ream process alternative (instead of boring)
- Sources of cryogenic equipment for shrink-fitting bushings
- Use of forklift truck for materials handling
- Information on use of index brazing machinery
- Revision of plant layout
- Information on manual and semi-automatic welding
- Product redesign assistance
- Technical data on heat cambering of girder webs
- Finished product storage plan
- Data on shaped rolls to reduce warpage and spread of springs
- Use of jib crane to handle spring assemblies
- Information on heat treating and extrusion dies
- Shear stop change to reduce manpower requirements
- Use of work sampling techniques to reduce production delays
- Use of electrostatic spray equipment
- Grind and buff operation to increase productivity
- Use of finished product storage racks
- Demonstration of brazing technique
- Design concept for frame-bending machine
- Suggestion of new end-forming technique for baseball bat
- Data on color anodizing
- Demonstration of use of Optical Comparitor for die accuracy
- Recommendation of heat treatment of toggle link material
- Improved tank and component design
- Design for assembly and welding fixtures

Management Assistance and Information

- Recommendation to buy blueprint machine
- Design of inventory control system
- Recommendation of two-shift machine operation to increase capacity
- Proposal of incentive scheme for quality control improvement
- Suggestion that full-time industrial engineer (cost cutting) be employed
- Mini-computer information
- Arrangement of visits to U.S. transformer plants by Korean manufacturer

Supply, Marketing and Licensing Information

- o Data on aluminum products and markets
- o Marketing of products
- o Licensing of U.S. company transformers to Korean manufacturer
- o Licensing of U.S. company heavy-duty conveyors to Korean manufacturer
- o Lists of U.S. suppliers of relays
- o Lists of manufacturers of automatic machine to make motors
- o Lists of U.S. industrial design firms
- o Lists of U.S. computer companies doing business in Korea
- o Lists of bottling equipment manufacturers
- o Lists of U.S. stores and firms importing stereo components
- o Lists of U.S. importers of tape cassettes

The acceptance of management and technical assistance by industries is dependent on a number of factors. The company management must have confidence in the consultants providing the assistance and must be willing to evaluate the ideas presented. Company pride sometimes prevents acceptance of recommendations from outside the company. The advantages of introducing new technology or changing old technologies must be seen by the company management. The company must have the resources to carry out the suggested changes.

In addition, it should be recognized that the acceptance period for new technology and ideas varies from one company to another. Some companies aggressively and quickly pick up new ideas and techniques; others proceed more conservatively in evaluating and implementing changes. In any event, recommendations frequently involve the expenditure of company money, manpower, and other resources. They must be thoroughly evaluated by management before decisions to proceed can be made.

Results

Based on twenty years of Georgia Tech experience in provision of management and technical assistance to more than 4,000 companies, the first year of activity with KCGF and Korean industries must be considered a success. Every company in the first-year program was provided some amount of technical information or assistance ideas. Some companies made good use of the services provided, while others made little or only moderate use of them initially. This is a normal industrial pattern of acceptance where essentially free extension services are provided to manufacturing companies.

The results obtained to date as a result of the management and technical assistance are listed in Appendix 2 (Summary Report) and Appendix 3 (Individual Company Reports).

Future Activity

It is recommended that KCGF personnel contact the 15 companies at six-month intervals in the future to determine use of recommendations and information as well as other problem areas which can be studied. This continuity of communication is important for the better utilization of the Extension Services Department's capabilities.

Appendix 1

KCGF TRAINING PROGRAM

Appendix 1

PROJECT A-2141
KCGF - SCHEDULE OF TRAINING
MAY 22-JUNE 16, 1978

Date	Time	Speaker	Location	Subject or Activities
May 22		Johnston	OIP	Assign office space
	9:00 a.m.	Hammond/ All Staff	OIP	Welcome
	9:30 a.m.	OIP Staff	OIP	Coffee and doughnuts
	11:00 a.m.	Johnston	OIP	Explain program, present publications, explain security
	2:00 p.m.	Hammond	OIP	Background and activities of OIP
	3:00 p.m.	Johnston	OIP	Tours - C&S Bank Building - Tech Campus
May 23	9:00 a.m.	Hammond/ Staff	OIP	The KCGF Approach to Furnishing Industrial Extension Services to SSI
	2:00 p.m.	Lodge	OIP	Needs of SSI
May 24	9:00 a.m.	Hammond	OIP	Small Industry Organization and Characteristics
	2:00 p.m.	Potts	OIP	Case Studies of Industries
May 25	9:00 a.m.	Hammond	OIP	Industrial Extension Theory and Practice - Guidelines
	2:00 p.m.	Potts	OIP	Case Studies of Industries
May 26	9:00 a.m.	Lodge	OIP	Industrial Extension Forms and Procedures
	2:00 p.m.	OIP Staff	OIP	Reception for KCGF students and Korean Community in Atlanta
May 29	11:00 a.m.	Ed Lewis	Albany	Orientation regarding Albany Area Office
	1:30 p.m.	Ed Lewis		Leave for Pelham
	2:00 p.m.	Ed Lewis	Pelham	Tour Hercules Bumpers, Inc.
	2:45 p.m.	Ed Lewis		Leave for Moultrie
	3:30 p.m.	Ed Lewis	Moultrie	Tour Southern Recaps, Inc.
	4:45 p.m.	Ed Lewis		Return to Albany
May 30	7:00 a.m.	James	Enigma	Drive to Enigma and tour Bomac Manufacturing
	1:00 p.m.	Dudley	Waycross	Drive to Waycross and visit Haynes Industries
	3:00 p.m.	Dudley	Douglas	Drive to Douglas and visit Douglas Foods, Inc.

Appendix 1 (continued)

Date	Time	Speaker	Location	Subject or Activities
May 31	9:30 a.m.	Edens	Baxley	Tour Selco Products, Inc.
	10:30 a.m.	Edens	Baxley	Tour Baxley Industries, Inc.
	2:30 p.m.	Edens	Claxton	Tour Alpha Galvanizing, Inc.
	5:00 p.m.	Edens	Savannah	Arrive at motel in Savannah
June 1	8:30 a.m.	Edens	Savannah	Meeting at Savannah Area Office to discuss office activities
	10:00 a.m.	James	Savannah	Depart Savannah
	2:00 p.m.	Craig	Jackson	Tour Quality Products Company
	4:00 p.m.	Craig	Macon	Meet with Tom Murphy and Tom Moody, Macon Chamber of Commerce
	5:00 p.m.	Craig	Macon	Tour of industrial parks
June 2	8:30 a.m.	Craig	Macon	Tour Brown and Williamson Tobacco Company plant
	10:30 a.m.	Craig	Thomaston	Tour Lanier Electronics Laboratories
	11:30 a.m.	James		Leave for Atlanta
June 5	9:00 a.m.	Fyffe	OIP	Technical Study-Cost Estimates
	2:00 p.m.	Lodge	OIP	Workshop - Case Study
June 6	10:00 a.m.	McCarty	C&S	Loan Management
	2:00 p.m.	Lodge	OIP	Project Feasibility Analysis - Workshop - Case Study
June 7	9:00 a.m.	Cheung	OIP	Pro Forma Financial Statement
	1:00 p.m.	Woodall	Trust Co.	Evaluation of Management Capabilities
June 8	9:00 a.m.	Clifton	OIP	Project Feasibility Study - Market Study
	2:00 p.m.	Lodge	OIP	Workshop - Case Study Preparation
June 9	9:00 a.m.	Malvar/ Dodd	Library	Data base searching
	2:00 p.m.	Lodge/ KCGF	OIP	Case study preparation
June 12	9:00 a.m.	KCGF	OIP	Presentation of case study problems by KCGF students
	2:00 p.m.	Johnston	OIP	Information - Sources and Use of Technical Information for Industrial Projects
June 13	10:00 a.m.	SBA	SBA	Management Assistance Programs of SBA
	2:00 p.m.	SBA	SBA	

Appendix 1 (continued)

Date	Time	Speaker	Location	Subject or Activities
June 14	10:00 a.m.	SBDC	Athens	Small Business Development Center; Loan Making - Finance
	2:00 p.m.	SBA	SBA	
June 15	10:00 a.m.	SBA	SBA	Loan Servicing - Portfolio Management
	2:00 p.m.	SBA	SBA	
June 16	9:00 a.m.		OIP	Research
	11:30 a.m.	Lodge	OIP	Graduation
	p.m.			OPEN

Appendix 2

SUMMARY REPORT OF PROJECT ACTIVITIES

SUMMARY REPORT
G I T SERVICES
APRIL 26, 1978-APRIL 25, 1979

Company	Products Involved	Number of Visits	Problems or Needs Observed	Action Taken	Comments
A	Cranes	10	Required information on network methods for production scheduling, improved welding processes and materials, heat cambering of main bridge girder web. Need for production methods improvement, inventory control.	Provided information on Critical Path Method of networking, manual and semi-automatic welding processes, heat cambering of girder webs to reduce materials, and process planning. Recommended assembly fixture techniques for control cab and crab frame, use of standardized drawings to reduce drafting time.	CPM network system being developed. A system of warehousing and parts withdrawal inventory control has been initiated. Standard drawings are being developed from information on master drawings. Shorter production time in welding and assembly operations is needed.
B	Aluminum extrusions for sash	7	Short life of extrusion dies (production per die approximately 5 to 10 tons compared with 25 tons in U.S. companies). Requested information on color anodizing, fluorocarbon painting, and anodic coating. Requested information on aluminum welding for new product line.	Provided information on heat treating and use of extrusion dies, including material on carbonitriding, cyaniding, analysis of cyanide salt baths, liquid carburizing, liquid nitriding, gas nitriding, and measurement of case depth. Recommended company consider ion-plasma nitriding at another Seoul company. Provided information on use of Optical Comparitor for checking accuracy of dies. Provided information on color anodizing, fluorocarbon painting and anodic coating, and aluminum welding and brazing. Reviewed plant layout and recommended finished product storage plan.	Company owner will translate technical information into Korean for use by technical staff. Review of proposed plant expansion may be desirable.
C	Extruded aluminum sash, baseball bats, automobile window frames, heat exchangers	7	Short extrusion die life (10 tons of extrusion per die compared with U.S. average of 25 tons). Information needed on die design and heat treatment, welding and brazing process. Window frame bending technique. Need for information on hydraulic circuits and maintenance. Need for rack storage.	Recommended use or disposition of electrostatic spray equipment; new method for grind and buff operation to increase productivity; installation of finished product storage racks to save floor space, reduce product damage; use of frame bending machine. Provided information on heat treatment, production of extrusion dies, design of dies, nitriding, cleaning and finishing of aluminum alloys, anodizing, and basic hydraulic circuitry.	Company trying ion-plasma nitriding of extrusion dies and now developing new brazing process. Company began to build aluminum storage racks. Additional assistance on bending machine design may be required. Samples of U.S. brazing alloys and flux would be helpful.

SUMMARY REPORT (continued)

Company	Products Involved	Number of Visits	Problems or Needs Observed	Action Taken	Comments
D	Injection molding machines	7	Requested information on jig and fixture design, and shrink fitting of hardened steel bushing into mild steel link. Strength of material for toggle link and boring procedure. Excessive vibration of center grinding machine.	Provided information on repair of iron castings, on sources of cryogenic equipment, on design of jigs and fixtures, on indexing brazing machines, on machine tool speeds and feeds. Recommended purchase or lease of forklift. Provided concept designs for welding and assembly fixtures and layout templates, and use of press-fitting bushing in toggle link. Suggested heat treating of toggle link, and trial heat treatment at Soong Jun University.	Company now using hydraulic press for bushing insertion. Samples are being prepared for heat treating at Soong Jun University laboratories. Plant layout and material handling assistance needed. Vibration reduction information for grinding machine would be helpful to company.
E	Transformers	6	Interested in licensing design for dry-type class II transformers from U.S. company, and production and sale of garbage disposal unit. Requested data on overcurrent relays. Assistance on transformer tank design and fabrication.	Provided contact with U.S. company interested in licensing its transformer. Recommend revision of present plant layout if future expansion is postponed. Wrote relay manufacturers and automatic equipment manufacturers (for motor manufacture) for data and sent to company. Improved design for transformer bank and components provided on assembly and welding fixtures, and on manual and semi-automatic welding. Invited company president to visit transformer plants in Georgia while in the U.S.	Company president to visit Georgia on U.S. trip. Continued assistance in tank fabrication methods, alternative materials, and new transformer designs would be helpful to the company.
F	Cassette recorders, stereo receivers	5	Assistance in case designs and inventory control. Requested list of U.S. importers of cassettes. Assistance requested in line automation.	Presented design proposal from a U.S. company for product redesign. Provided names and addresses of U.S. retailers (potential buyers of company products). Recommended alternative incentive schemes to improve quality. Provided letters from computer companies.	Company is interested in quality control, better stockroom layout, and assembly line improvement.

SUMMARY REPORT (continued)

Company	Products Involved	Number of Visits	Problems or Needs Observed	Action Taken	Comments
G	Automotive leaf springs	4	Early failure on spring assemblies on life cycle fatigue test. Excessive warping after heat treatment.	Provided process information from similar U.S. company. Also provided SAE data on spring design. Heat treating process data provided. REcommended hydraulic press use. Recommended trial heat treatment to improve life cycle. Recommended changes in shear stop set-up, and use of jib crane for materials.	Company has installed small press and die for clamping spring assembly.
H	Tuners, stereo receivers, and amplifiers	4	Interested in expanding into U.S. market. Wants improved inventory control system.	Provided a list of potential U.S. customers, information on computers, and two books on design of jigs and fixtures. Demonstrated work sampling technique to determine reason for assembly-line delays. Recommended employment of industrial engineer for cost reduction work.	Company continues to be interested in quality control improvement, computer time sharing, and assembly line balancing.
I	Battery-powered locomotives, mining cars, conveyors, vibrating screens and crushers	2	Wants to license conveyor design from U.S. company. Plans to construct new plant. Wants assistance with conveyor belt production, and quality control.	Provided list of U.S. manufacturers of heavy-duty conveyors, and of belting.	Company still interested in licensing arrangement with a U.S. conveyor company.
J	Wrenches, files, miscellaneous hand tools, forged auto parts	3	Needs more production capacity and productivity.	Recommended two-shift operation of critical machines, designed work-in-process handling box and method, recommended combining drilling and deburring operations, and tool count calculation by weight rather than count.	
K	50 to 100 cc glass bottles	2	Poor working conditions in present plant. Interested in automated bottle production, inspection and packaging. Also interested in reduced noise, greater safety.	Advised U.S. bottle machinery manufacturers of company's interest in automation.	Based on information provided to company, the company president ordered for June delivery an EMHART 15 machine for use by another company in the same industrial group.

SUMMARY REPORT (continued)

Company	Products Involved	Number of Visits	Problems or Needs Observed	Action Taken	Comments
L	Diamond industrial tools	1	Information on diamond tool design and technology. New plant planned in 1979.	Conducted literature search and provided company with extensive listing of literature on industrial diamond industry.	
M	Blenders, cookers, heaters, fans, hot plates (second-year company)	2	Problems in metal tearing in deep draw process, utilization of storage space, need for improvement in painting and baking area. Data needed on ventilator hoods and standards. Recommendation on plant expansion alternatives.	Provided data on ventilator hood design and standards. Recommended finished product storage change to racks, pallets, forklift truck. Analyzed two alternatives for plant expansions. Suggested trolley conveyor use in painting area. Evaluated deep draw metal tearing problem.	Possible review of new plant layout. Assistance in new product line (gas hot plate). Suggest better method for bending heater elements to avoid insulation breakdown.
N	Hand files and rasps (second-year company)	1	Problem in plant layout, materials flow, labor-intensive practices. Needs assistance in grinding and heat treating processes.	None to date.	Company needs assistance in layout, materials flow, automation, grinding and heating activities.
O	Steel cargo containers (second-year company)	1	Excessive labor turnover. Painting and welding (distortion) activities need to be studied.	None to date.	Generally this a progressive, well-run company which will require little assistance.

Appendix 3

INDIVIDUAL COMPANY REPORTS

COMPANY A

Number of Visits: Ten by GIT and KCGF personnel.

Principal Products: Cranes.

Observed Problems

The problems observed included a request for information on network methods such as CPM and PERT for production scheduling, and assistance on production methods for improving the process and reducing their labor input.

The company also required information on improved welding processes and material. The company had a problem in heat cambering the main bridge girder web in order to achieve a materials savings.

Action Taken to Solve Problems

Information was provided the company on the Critical Path Method of networking for production scheduling, reprinted from Production Management, by Buffa. Also, extracted and reprinted from Buffa was the section on Process Planning for Production. Information was provided in the use of standardized drawings to reduce drafting time and expense.

Recommendations were made on assembly and welding fixtures for manufacturing the control cab frame and the crab frame.

Extensive information was provided on manual and semi-automatic welding processes. This information included reprints on manual metal arc welding from The Metals Handbook, data on flux cored arc welding, and manufacturers' brochures obtained in Seoul at the U.S. machine and tool show, plus extensive data on heat cambering large beams. The information provided was from United States Steel Corporation and included two publications; other data came from the U.S. Department of Transportation and from a manufacturer of bridge girders in Augusta, Georgia, using the heat cambering process.

Observed Results from GIT Assistance

This company has already started developing a network system for production scheduling. Information which had previously been supplied by a

GIT consultant during a previous visit had been adapted for use by the company; also, it has initiated a system for inventory control which includes proper warehousing and control of parts withdrawal. Standard drawings are being produced.

Recommendations for Future Assistance

Future assistance needs would include continued stimulation and assistance to the company in initiating improved welding processes. The major desire of the company is to shorten the cycle time for producing a crane assembly, and to reduce labor costs. The greatest opportunities for both dollar savings and shortened cycle time would be in the welding and assembly operation.

COMPANY B

Number of Visits: Seven by GIT and KCGF personnel.

Principal Products: Aluminum extrusions for sash.

Observed Problems

The extrusion dies had an extremely short life in comparison with extrusion die life in the United States using the same alloy and producing similar products. The company has a production per die of approximately 5 to 10 tons, compared to around 25 tons per die for similar U.S. companies.

This company required information on the anodizing process. Of particular interest to the company were the processes of color anodizing, fluorocarbon painting and anodic coating. The company also required information on aluminum welding for a proposed new product line.

Action to Solve Problems

The action taken on this problem, which was previously reported, was that information was provided on aluminum extrusion die design. A reprint of a publication on this subject by the Kaiser Aluminum Company was given to the company, as well as reprints from The Metals Handbook (American Society of Metals) on subjects such as carbonitriding, cyaniding, analysis of cyanide salt baths, liquid carburizing, liquid nitriding, gas nitriding, and methods of measuring case depth.

Other information given the company concerned ion-plasma nitriding, which is available in Seoul from Hyundae Company. This ion-plasma nitriding process can nitride the die without any distortion, and should considerably improve die life.

Also supplied was information on the use of the Optical Comparitor for checking the accuracy of the die coming from the die shop. During this visit, the United States had a machine and tool show in Seoul where several Optical Comparitors were exhibited. It was recommended that the company take one of its extrusion dies to the tool show and have the Optical Comparitor demonstrate the means for checking die accuracy.

Information was provided the company on cleaning and finishing aluminum and aluminum alloys. The information was obtained from reprints from The Metals Handbook and included both mechanical and chemical means of finishing. With the chemical means of finishing, much of the anodizing process and the process parameters were covered as well. The information also included techniques for color anodizing.

Further information will be furnished the company on fluorocarbon painting and anodic coating. Information was provided on various means of aluminum welding and aluminum brazing; this information also came from reprints from The Metals Handbook, as well as from brochures obtained at the machine and tool show held in Seoul.

Observed Results from GIT Assistance

The company owner is now translating the technical information supplied him from English into Korean for use by his technical staff. No immediate results were observed, other than the translation process.

Recommendations for Future Assistance

After the information on anodic coating, fluorocarbon painting, and color anodizing is provided to this company, no immediate future needs are anticipated.

COMPANY C

Number of Visits: Seven by GIT and KCGF personnel.

Principal Products: Extruded aluminum sash, aluminum baseball bats, aluminum automobile window frames, aluminum heat exchangers.

Observed Problems

Low extrusion die life. This company gets only 10 tons of aluminum extrusions per die before it must be rebuilt. This compares with about 25 tons per die among American extruding companies using the same aluminum alloy. The company required information on die design and heat-treating methods in order to increase die life, as well as data on hydraulic circuits and maintenance. The welding and brazing processes and window bending techniques needed improvement.

Action to Solve Problems

The following information and assistance were given to the company in order to solve its die problems:

1. Process information from an American aluminum extrusion company. The information indicated the following process conditions:

   a. Die steel alloy should be the equivalent of American designated H-12 or H-13 tool steel. The chemistry of these tool steels is:

	Carbon	Silicon	Tungsten	Chromium	Vanadium	Molybdenum
H-12	.033	.085	1.25	5.00	0.20	1.45
H-13	.040	1.00	-	5.00	1.00	1.00

   b. Dies made from these two types of die steel should be heat-treated with a final nitriding step. This will provide a hardness of 46 to 48 on the Rockwell "C" hardness scale. During the extrusion process, the American company also uses a 60.63 aluminum alloy.

2. A reprint of "Aluminum Extrusion Die Design," published by Kaiser Aluminum Company in the United States. This publication consists of some 75 pages of detailed engineering information in such areas as extrusion die

design; die layout and design; determining solid die-making time mathematically; electrical discharge machining; practices, problems and corrective measures in extrusion press tooling; extruded and drawn tube, hollow shapes and sizes of dies employed; handling and maintenance of extrusion tools; and general tables.

3. Information on extrusion die nitriding. This information was reproduced from The Metals Handbook, published by the American Society of Metals. The information included carbonitriding, cyaniding, analysis of cyanide salt baths, liquid carburizing, liquid nitriding, gas nitriding, and methods of measuring case depth.

4. Information on a method of nitriding extrusion dies by the ion-plasma nitriding process. This process is currently being used in Korea, and the equipment is available in the Seoul area.

5. Information on furnace and oven-brazing aluminum assemblies. This information also was extracted from The Metals Handbook.

6. Information on aluminum brazing alloys and flux. In addition to providing general information, samples of aluminum brazing alloy and flux were obtained from a company in Seoul and trials were conducted in the Yushin factory.

7. Information on the cleaning and finishing of aluminum alloys. This information, which includes data on anodizing, color anodizing, and cleaning (both mechanical and chemical), was reproduced from The Metals Handbook.

8. Information on conceptual designs for a frame-bending machine. This bending machine concept, if put into practice, will produce higher-quality window frames with less labor.

9. Information on the finishing process for aluminum baseball bats. Presently, this finishing process is very labor-intensive and has a very low quality level.

10. Information on basic hydraulic circuitry and components. The company requested this information in order to be able to provide proper maintenance on the main extrusion presses.

COMPANY D

Number of Visits: Seven visits by GIT and KCGF personnel.

Principal Products: Injection molding machines.

Observed Problems

This company required information on the design of jigs and fixtures for improving its manufacturing process. Not only could better equipment decrease the labor required to lay out and assemble the component parts, but their greater accuracy also would improve the quality of parts produced.

The company also required assistance on processes and techniques for shrink fitting a hardened steel bushing into a mild steel toggle link.

One problem observed was that an alternate process for boring the holes in the toggle links was most desirable. Currently these holes are located and then put into the toggle link by a boring process.

Another problem observed was that a stronger material is needed for the toggle link body. Field failures presently are occurring because the toggle links do not have high enough tensile or yield strength to withstand pressures encountered during the injection molding process.

A third problem was that the bed planer was causing excessive vibration to a very sensitive center grinding machine. This vibration caused the finished part coming from the grinding machine to fail to meet the required tolerances for dimension and surface conditions.

Action to Solve Problems

1. Conceptual designs were provided for welding and assembly fixtures for the main injection molding machine frame. This design included a sub-assembly layout fixture for the tops and bottoms of the frame, as well as a final assembly welding fixture which would provide the accuracy as well as positioning the weldment so that the weld metal disposition rate could be increased.

2. Conceptual designs were provided for a layout templet. These layout templets would be used to provide proper location of holes and assemblies onto the machine and would decrease the labor as well as improve the accuracy of the locations.

3. Assistance was provided in making calculations required for press-fitting the hardened steel bushing into the toggle link.

It was determined from these calculations that if the proper dimensions were held and tolerances maintained, adequate fitting of the bushing into the toggle link could be obtained by means of a hydraulic press without the use of shrink-fitting techniques.

Information was provided on the drilling and reaming process as an alternate to boring holes in the toggle link. This information was reprinted from the Machinery Handbook. Information also was supplied on the use of a simple heat-treating technique to increase the strength of the existing toggle link material.

It was discovered that the existing material was the equivalent of AISI-1025 steel. While this steel is considered a relatively low-carbon steel, it has a carbon range of from 0.22 to 0.28%. By heating this steel to between 857°C and 899°C, then quenching in a water or brine quench, then reheating it to 533°C for about 45 minutes, the tensile strength of this steel can be increased 21% -- from 80,000 lbs. per square inch to 97,000 lbs. per square inch. The yield strength can be increased 50%, from about 50,000 lbs. per square inch to some 75,000 lbs. per square inch. This tempering process still will allow the hardness to remain in a range which will provide for relatively easy machinability.

It was arranged for samples of the toggle link to be sent to the Mechanical Engineering Department, Soong Jun University, where Professor Lim will give a trial heat treatment of these parts in the laboratory's heat-treating furnace. After the trial heat treatment, the yield and tensile strengths will be tested, as well as the hardness, to determine if the strength can be improved by heat treating.

Information on the reduction -- or prevention -- of vibration to the grinding machine will be provided within two months after the return of the GIT representative to the United States. In the United States a great deal of information is on file at GIT on vibration reduction/prevention. As soon as this information is researched and pertinent articles selected, it will be airmailed to KCGF for transfer to the company.

Overall Results Observed

This company is now using a hydraulic press for pressing the bushings into the toggle link. They are checking tolerances and dimensions of the link hold and the bushing diameter very carefully and are very pleased with the results they are now getting. Also, the company has contacted Soong Jun University's Mechanical Engineering Department, and samples are being prepared for the heat treatment trials.

Recommendations for Future Assistance

Company D will require only a minimal amount of assistance in the areas of jig and fixture design. In the future, this company may also require some assistance in plant layout improvement, as well as in determining economic lot sizes for some of its component parts.

COMPANY E

Number of Visits: Six visits by GIT and KCGF personnel.

Principal Products: Transformers.

Observed Problems

Initially, problems were indeterminate. Later visits indicated that this company required extensive information and assistance on transformer tank design and other transformer fabrication processes.

Action to Solve Problems

The GIT representative provided information on improved design for the transformer tank and components. Because of the GIT representative's considerable previous experience in the manufacture of similar transformer tanks and components, a great deal of the information was delivered from memory rather than from reprints. Conceptual designs for assembly and welding fixtures were provided to the company. These welding fixtures would provide not only a more accurate dimensional control over the transformer tanks, but would also reduce assembly time, welding time, and tank materials.

Extensive data were supplied to this company on both manual and semi-automatic welding processes. The information included manual metal arc welding and flux cored arc welding, as extracted from The Metals Handbook (American Society of Metals).

An official letter of invitation to the company president was written by the GIT consultant which enabled the president to obtain a visa to visit the United States. During this visit, the GIT consultant will arrange for the president to visit several companies in Georgia to observe manufacturing techniques. This should provide him with valuable information on ways to improve the manufacture of his company's products.

Observed Results from GIT Assistance

Future needs will be for continued assistance in tank fabrication methods and techniques, and also in alternative materials to be used in transformer manufacturing. Data also will need to be furnished on new designs for producing an explosion-proof dry-type transformer.

COMPANY F

Number of Visits: Five by GIT and KCGF personnel.

Principal Products: Cassette recorders, stereo receivers.

Observed Problems

The company wants to redesign its case for greater acceptability in the U.S. market, and to meet competition. It further desires to upgrade its inventory control system to something just short of a computerized system. It also would like names and addresses of potential customers in the U.S., as well as assistance in analysis of its assembly line operation. Company is interested in a joint venture with a U.S. company.

Action Taken to Solve Problems

Presented the company with a design proposal from a U.S. industrial design company. Provided names and addresses of U.S. retailers which are potential buyers of the company's products. Inventory control system improvement was discussed with company president. Recommended alternative incentive schemes to improve quality. Provided company with letters from U.S. computer companies.

Observed Results from GIT Assistance

Results from these actions have not been reviewed and evaluated as yet.

Recommendations for Future Assistance

In the future, joint venture possibilities with a U.S. company should be investigated further.

COMPANY G

Number of Visits: Four visits by GIT and KCGF personnel.

Principal Products: Automotive leaf springs.

Observed Problems

The problems observed included a premature failure of the spring assemblies on a life-cycle test. This company's major customer, an automobile manufacturer, desires a spring assembly which can meet a 200,000-cycle life test. At present, the company can only produce spring assemblies which reach about 150,000 cycles before failure.

Another problem reported was that the individual spring leaves exhibit excessive warping after heat treatment.

No new problems were observed in later visits. The company did not seem too receptive to the information, which had been supplied after a great deal of work and much research.

Action to Solve Problems

1. Prior to the current visit by the GIT representative, calls were made to manufacturers of springs in the United States which use identical material and make a very similar product. This information was passed on to the company after the GIT representative arrived in Korea.

In addition, a complete reprint of a book entitled Heavy Duty Truck Suspensions, published by the Society of Automotive Engineers, was given to the company. This book includes many design considerations for individual leaf springs, coil springs, and major spring assemblies.

Materials were reprinted from The Metals Handbook, published by the American Society of Metals, covering subjects such as the composition of standard steels, hardness conversion tables, steel selection for hardenability, and steel selection for fatigue resistance. Reprints from the Sunbeam heat-treating data book also were provided to this company. The book includes heat-treating recipes and many heat-treating hints which are very practical (not theoretical) in nature. Information on tempering AISI-5160 steel was taken directly from the Machinery Handbook.

Finally, a heat-treatment trial procedure, using a lower quench temperature in the hardening bath along with agitation, was suggested to this company. It was hoped that by using this trial heat-treatment procedure, a sample could be taken and then compared with a sample of the material from their present process. This comparison will be made by the Mechanical Engineering Department, Soong Jun University.

Since there was little dynamic response from the company, no attempt was made to seek out new problem areas, and no action was taken to solve currently observed problems.

Observed Results from GIT Assistance

The only results observed from previous GIT visits was that the company has installed a small press and die for hydraulically clamping the spring assembly together rather than using the previous method of manually hammering the clamp assembly.

Recommendations for Future Assistance

Future assistance needs for this company are unknown.

COMPANY H

Number of Visits: Four visits by GIT and KCGF personnel.

Principal Products: Tuners, stereo receivers, and amplifiers (high quality)

Observed Problems

The company is interested in expanding into the U.S. market. An improved inventory control system is desired.

Action to Solve Problems

The company was given a list of U.S. department stores and companies which are potential customers. Information on the use of micro-computers and two books on the design of jigs and fixtures were provided to the company. A work sampling technique was demonstrated to company personnel, to be used to analyze reasons for assembly line delays. As a way of reducing costs, it was recommended that the company employ an industrial engineer.

Observed Results from GIT Assistance

Not yet determined.

Recommendations for Future Assistance

Assistance in assembly line balancing. Quality control assistance. Investigate time sharing possibility with Soong Jun computer installation.

COMPANY I

Number of Visits: Two visits by GIT and KCGF personnel.

Principal Products: Battery-powered locomotives, mine cars, car tippers, mine conveyors, vibrating screens, impact crushers.

Observed Problems

Company wishes assistance with production of conveyor belt. Carrier rollers have quality control problems. Interested in licensing U.S. conveyor design.

Action to Solve Problems

A list of U.S. manufacturers of heavy-duty conveyors was provided to the company as possible contacts to discuss license arrangements. A letter was sent to members of the Conveyor Equipment Manufacturers Association; replies from nine companies were provided to KCGF, translated into Korean, and forwarded to the company for analysis and action.

Observed Results from GIT Assistance

Company is studying conveyor manufacturer letters, preparatory to proceeding with licensing matter.

Recommendations for Future Assistance

Review of plans for new plant layout. Possible assistance in obtaining license from a U.S. company.

COMPANY J

Number of Visits: Three visits by GIT and KCGF personnel.

Principal Products: Wrenches, files, miscellaneous hand tools, forged automobile parts.

Observed Problems

Company needs more production capacity to meet demands for its products. When visited, plant operation was on six-day basis, ten hours per day.

Action to Solve Problems

Recommended two-shift operation on critical machines causing bottlenecks in production. Designed material-handling box and method for handling forging blanks and forgings, and tote box for parts in finishing operation. Suggested combining deburring and drilling operations. Recommended counting of tools by weight rather than physical count.

Observed Results from GIT Assistance

Company prepared material-handling box for handling forging blanks and forgings and tested method. Other results are not known.

Recommendations for Future Assistance

Methods studies to improve productivity.

COMPANY K

Number of Visits: Two visits by GIT and KCGF personnel.

Principal Products: 50 to 100 cc glass bottles.

Observed Problems

Present plant has poor working conditions. New plant is planned. Company interested in automated bottle equipment, inspection and packaging. Noise and safety are areas needing improvement.

Action to Solve Problems

Advised U.S. bottle machinery manufacturers of company's interest in automation. Manufacturers' letters forwarded to KCGF, which translated them into Korean and forwarded them to the company for review and action.

Observed Results from GIT Assistance

Based on information provided to the company, the company president ordered for June delivery an EMHART 15 machine for use by another company in the industrial group.

Recommendations for Future Assistance

Possible review of new plant layout.

COMPANY L

Number of Visits: One visit by GIT and KCGF personnel.

Principal Products: Diamond industrial tools.

Observed Problems

Company needs information on design technology. New plant planned for 1979.

Action to Solve Problems

Conducted literature search on diamond industrial tool design and provided company with resulting list of technical information publications. Offered to provide copies of material of specific interest to company.

Observed Results from GIT Assistance

Not known.

Recommendations for Future Assistance

Possible review of new plant layout.

COMPANY M

Number of Visits: Two visits by GIT and KCGF personnel.
(This company to be provided assistance in second year)

Principal Products: Blenders, cookers, heaters, fans, hot plates.

Observed Problems

Problem of metal tearing on deep draw process. Inefficient use of finished product storage space. Need for improvement in painting and baking area. Breakdown of insulation in bending heater elements. Data needed on ventilator hood design and standards. Recommendations on alternative plant expansion possibilities requested.

Action to Solve Problems

Provided data to company on ventilator hood design and standards. Recommended finished product storage area change to racks, pallets, and forklift truck. Analyzed alternatives for new manufacturing building construction. Suggested trolley conveyor use in washing and drying process before painting. Evaluated deep drawing metal tearing problem.

Observed Results from GIT Assistance

None to date.

Recommendations for Future Assistance

Possible review of new building layout. Suggest better method for bending heater element (perhaps hydraulic system) to avoid insulation breakdown.

COMPANY N

Number of Visits: One visit by GIT and KCGF personnel.

Principal Products: Hand files and rasps.

Observed Problems

Company has problems in plant layout, materials flow and handling, and labor-intensive practices. Company needs assistance in grinding and heat-treating processes.

Action to Solve Problems

None to date.

Observed Results from GIT Assistance

None to date.

Recommendations for Future Assistance

Assistance in observed problem areas.

COMPANY O

Number of Visits: One visit by GIT and KCGF personnel.
(This company to be provided assistance in second year.)

Principal Products: Steel cargo containers.

Observed Problems

Excessive labor turnover is a problem for the company. Painting activity merits investigation. Distortion in welding is another problem area.

Action to Solve Problems

None to date.

Observed Results from GIT Assistance

None to date.

Recommendations for Further Assistance

Investigate painting and weld distortion problems and make recommendations for correction as appropriate. Company appears to be well run and technically competent.